

BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 3

DECEMBER 1955

PART 4

INSTITUTE NEWS

Election of Members

The following 17 Ordinary Members, 5 Junior Members, and 14 Student Members were elected on 31 October 1955:

As Ordinary Members

BATES, William Kenneth, A.M.C.T., Manager, Metal Treatment Department, Albright and Wilson, Ltd., 49 Park Lane, London, W.1.

BERGHEZAN, Aurel, Ing.Dr., European Research Associates, 95 rue Gatti de Ghamond, Bruxelles, Belgium.

CALNAN, Edward Arthur, B.Sc., Ph.D., Principal Physicist, Fulmer Research Institute, Stoke Poges, Bucks.

CHANDRASEKHAR, Bellur Sivaramiah, M.Sc., D.Phil., Department of Metallurgy, Research Laboratories, Westinghouse Electric Corp., Churchill Borough, East Pittsburgh, Pa., U.S.A.

COLE, Henry George, B.Sc., Principal Scientific Officer, Ministry of Supply, Room 224, St. Giles Court, London, W.C.2.

EICKHOFF, Klaus Joachim, Dipl. Phys., Wissenschaftlicher Mitarbeiter der Prüf- und Forschungsabteilung, Wieland-Werke A.G., Ulm-Donau, Western Germany.

GELLATLEY, Charles William Jarvis, A.I.M., Research and Development Manager, Baker Platinum (Precious Metals Division, Engelhard Industries, Ltd.), Green Lane, Horton Road, Datchet, Bucks.

GREENAWAY, Henry Thomas, M.Met.E., Senior Scientific Officer, Aeronautical Research Laboratories, Melbourne, Vic., Australia.

HUFFMAN, Clifton J., Technical Superintendent, Kaiser Aluminum and Chemical Corp., P.O. Box 7354, Halesowen, Md., U.S.A.

JANSEN, François Petrus, Metallurgical Chemist, Box 49, Abenab, South West Africa.

KOVITZ, Julius, B.S., Chief Metallurgist, La Metallo-Chimique S.A., 10 rue d'Egmont, Bruxelles, Belgium.

MCDONALD, Allen Stephen, B.S., Research Metallurgist, Handy and Harman, Bridgeport 9, Conn., U.S.A.

READ, Professor Thomas A., Ph.D., Head, Department of Mining and Metallurgical Engineering, University of Illinois, Urbana, Ill., U.S.A.

SCHAUMANN, Holger Heinrich, Ph.D., Laboratory Director, Pigments Department, E.I. du Pont de Nemours and Co., Newport, Dela., U.S.A.

TARQUINEE, Val, B.S. (Ch.E.), Senior Metallurgist, Aramco Overseas Co., The Hague, Netherlands.

VASUDEVAN, Pathiyil, B.Sc., Research Student, Department of Metallurgy, University of Manchester.

WRIGHT, Geoffrey Henry, Metallurgist, H. Rollet and Co., Ltd., 6 Chesham Place, London, S.W.1.

As Junior Members

AMBROSIO, Nelly Haidée, Ing.Quim., Laboratorio de Investigaciones Metalúrgicas, Comisión Nacional de Energía Atómica, Avda Libertad. San Martín 8250, Buenos Aires, Argentina.

BULLOUGH, Ronald, B.Sc., Research Student, Department of Metallurgy, University of Sheffield.

LIBANATI, César Mario, Ing.Quim., Laboratorio de Investigaciones Metalúrgicas, Comisión Nacional de Energía Atómica, Avda Libertad. San Martín 8250, Buenos Aires, Argentina.

LLOYD, Gwilym Charles, Experimental Staff, Research Laboratories, The General Electric Co., Ltd., North Wembley, Middx.

TEE, Peter Arthur Handbury, A.R.I.C., Scientific Staff, Metallurgy Group, Research Laboratories, The General Electric Co., Ltd., North Wembley, Middx.

As Student Members

ABENDROTH, Reinhard Paul, M.S., Department of Metallurgy, Missouri School of Mines and Metallurgy, University of Missouri, Rolla, Mo., U.S.A.

CHRISTIE, John A. C., Undergraduate, Department of Metallurgy, University of Cambridge.

COPEMAN, Richard Charles, Undergraduate, University of Cambridge.

DAVIES, Alan Llewellyn, B.Sc., Research Student, Department of Metallurgy and Fuel Technology, University College, Newport Road, Cardiff.

FLORRY, John Stephen, Undergraduate, Department of Metallurgy, University of Sheffield.

GARDNER, Leslie Richard Thomas, B.Sc., Robert Styring Research Scholar, Department of Metallurgy, University of Sheffield.

HUGHES, Peter Charles David, Undergraduate, Department of Metallurgy, University of Manchester.

PADGETT, Gerald Charles, B.Sc., C.G. Carlisle Post-Graduate Scholar, Department of Metallurgy, University of Sheffield.

RHODES, Derek, B.Met., Scientific Officer, United Kingdom Atomic Energy Authority (Industrial Group), Sellafield, Cumberland.

ROSE, Alan Martin, B.Sc., Research Student, Department of Physical Metallurgy, University of Birmingham.

PERSONAL NOTES

SHIH, Sheng-tai, M.S., Ph.D., Department of Metallurgy, School of Mines and Metallurgy, University of Missouri, Rolla, Mo., U.S.A.

TAYLOR, Anthony, B.Sc., Research Student, Department of Physical and Theoretical Metallurgy, University of Birmingham.

WEART, Harry Waldron, B.Met.E., M.S., Graduate Student, Department of Mining and Metallurgy, University of Wisconsin, Madison 5, Wis., U.S.A.

Institute's Arms in Colour

Copies, suitable for framing, are now available of the colour plate of the Institute's Arms which appeared in the index issue of Vol. 82 of the *Journal*. They may be obtained, price 2s. 6d. each, post free, on application to the Secretary.

"Journal" and "Metallurgical Abstracts" Bound Volumes Required

In the September issue of the *Bulletin*, a request was made for bound volumes of the *Journal* from 1908 to 1930 (Vols. 1-44). A number of members responded to this appeal, and no more copies of these volumes are required for the present. An urgent need still exists, however, for bound volumes, in good condition, of the following:

Journal : 1940 (Vol. 66) and 1942 (Vol. 68).

Metallurgical Abstracts : 1940 (Vol. 7), 1941 (Vol. 8), 1942 (Vol. 9), 1943 (Vol. 10), and 1945 (Vol. 12).

The Institute will pay £1 per volume for these.

PERSONAL NOTES

DR. P. J. ALLENDER has left the B.S.A. Group Research Centre and has joined the Research Department of the British Thomson-Houston Co., Ltd., Rugby.

MR. L. BADONE has left Light Alloys, Ltd., Haley, Ont., and has been appointed Metallurgist "A" with the Engineering Division of Avro Aircraft, Ltd., Malton, Ont.

MR. C. J. BARFIELD has left the laboratories staff of The de Havilland Aircraft Co., Ltd., Hatfield, to become Assistant Metallurgist to the A.P.V. Co., Ltd., Crawley.

MR. J. W. BERRY, Joint Managing Director of Birmingham Aluminium Casting (1903) Co., Ltd., has been appointed to the board of Birmid Industries, Ltd.

MR. W. D. BIGGS has been awarded the Ph.D. degree of Birmingham University and has now returned to Murex Welding Processes, Ltd., Waltham Cross.

MR. J. G. BUCHANAN recently received a presentation to mark the completion of 50 years' service as a director of the Expanded Metal Co., Ltd.

MR. H. S. CAMPBELL has been appointed Head of the Corrosion Section of the British Non-Ferrous Metals Research Association, in succession to Dr. P. T. Gilbert.

DR. P. W. CLARK has left The Derbyshire Silica Firebrick Co., Ltd., and has been appointed Chief Technologist to J. and J. Dyson, Ltd., Stannington, near Sheffield. He has also been appointed a director of the Yorkshire Testing Works, Ltd., and Beecroft and Partners (Metallurgists), Ltd.

MR. R. E. COPE has become President and General Manager of Rapidcast Corp., Grand Rapids, Mich.

DR. F. C. FRARY, of the Research Laboratories of the Aluminum Company of America, was awarded the Guido

Donegani Gold Medal at a recent meeting in Milan, for his services in the field of the metallurgy of light metals.

MR. K. S. GANAPATI has been appointed Deputy Assistant Director General (Metals) of Ordnance Factories, Calcutta.

MR. S. E. HADDEN has retired from the staff of the British Non-Ferrous Metals Research Association, which he joined in 1937.

MR. J. R. HANDFORTH has been appointed Technical Director of Birmetals, Ltd., and Birmabright, Ltd.

MR. J. G. HINES has left the Metallurgy Department of Cambridge University, having obtained the M.A. degree, and is now a Technical Officer on the staff of Imperial Chemical Industries, Ltd., Billingham Division.

MR. P. HOESLI has joined the Liaison Department of the British Non-Ferrous Metals Research Association.

MR. E. HOLMES has been appointed a lecturer in the Department of Metallurgy, University of Nottingham.

DR. HSUN HU has joined the Westinghouse Electric Corp., East Pittsburgh, Pa.

MR. G. J. HUTTON is now at the Department of Physics, Royal Military College of Canada, Kingston, Ont.

MR. C. G. T. HYSLOP has retired from the post of Managing Director of The Phosphor Bronze Co., Ltd., but remains a director of the company. He has been appointed a director of Kent Alloys, Ltd., and also of Birfield Industries, Ltd.

MR. R. S. JACKSON has left the British Non-Ferrous Metals Research Association to become Works Metallurgist to Deloro Stellite, Ltd., Birmingham.

DR. W. J. KROLL has received the Albert Sauveur Achievement Award presented by the American Society for Metals.

MR. M. A. LAURIENTE has been awarded the D.Eng. degree of the Johns Hopkins University and is now with the Westinghouse Electrical Corp., Baltimore.

MR. T. B. MARSDEN has left University College, Swansea, where he has been engaged in postgraduate research, and has taken a post in the Research Department, Imperial Chemical Industries, Ltd., Metals Division, Birmingham.

DR. S. MOCARSKI has joined the Production Engineering Staff of the Ford Motor Company of Canada, Ltd., Windsor, Ont.

MR. W. G. MOCHRIE has been appointed Managing Director of Tyseley Metal Works, Ltd., Birmingham. Until recently he was London manager of the firm, in charge of technical sales and development.

PROFESSOR L. F. MONDOLFO has been promoted to be Director of the Department of Metallurgical Engineering, Illinois Institute of Technology, Chicago.

MR. G. V. NASH has joined Dyson and Co. Enfield (1919), Ltd., Ponders End, Enfield, Middlesex.

DR. H. M. OTTE has left the University of Illinois and is now working in the Department of Theoretical Metallurgy, University of Birmingham.

PROFESSOR A. PORTEVIN has been awarded an honorary doctorate by the Rheinisch-Westfälische Technische Hochschule, Aachen.

MR. J. A. ROBINSON has left King's College, Newcastle-upon-Tyne, having obtained a B.Sc. (Hons.) degree, and is now a Junior Research Metallurgist with Metropolitan-Vickers Electrical Co., Ltd., Manchester.

LETTERS TO THE EDITOR

DR. J. SAWKILL has been appointed a Research Scientist at the Tube Investment Research Laboratories, Hinxton Hall, near Cambridge.

MR. J. B. SMART is now Foundry Manager with Barr and Stroud, Ltd., Anniesland, Glasgow.

MR. M. D. SMITH has left Sheffield University and taken a post in the Titanium Research Department, Imperial Chemical Industries, Ltd., Birmingham.

PROFESSOR H. F. TAYLOR has been appointed to the newly created American Brake Shoe Company Professorship of Foundry Metallurgy at Massachusetts Institute of Technology. He was already Professor of Mechanical Metallurgy and Director of the Foundry Laboratory at M.I.T.

MR. D. H. WILKINSON has been appointed Assistant Research Metallurgist to the Cerro de Pasco Corp., La Oroya, Peru.

DR. J. WINTON has left the A.E.I. Research Laboratories, Aldermaston, to join the staff of the U.K. Atomic Energy Authority at the Industrial Group Headquarters, Risley, Lancs.

MR. R. WOODWARD has left King's College, Newcastle-upon-Tyne, and is now engaged in the Metallurgical Laboratory of the Fairey Aviation Co., Ltd., Hayes, Middlesex.

OBITUARY

Mr. E. G. King

It is with regret that we have to record the death, in his 79th year, of Mr. ERNEST GERALD KING, Chairman of the Louis Cassier Co., Ltd., and an Original Member of the Institute. His death took place in hospital at Chichester on 22 October 1955.

Mr. King was born in India and came to England when he was 17. After spending two years as secretary to Lord Lugard, he joined Mr. Louis Cassier, an American magazine publisher who had founded *Cassier's Magazine*, an engineering and shipbuilding periodical. On Cassier's death in 1906, Mr. King acquired control of the Louis Cassier Co., Ltd., and became Managing Director. Under him, the firm's activities widened with the introduction of a number of other now well-known technical journals including *Metal Industry*, *Iron and Steel*, *Mechanical Handling*, *Welding*, and *Machine Shop Magazine*, as well as a series of handbooks and directories.

After the death in action of his son Gerald, in 1942, Mr. King decided that the Louis Cassier Co., Ltd., should become part of the Iliffe group, he himself continuing for a time as Managing Director and then as Chairman.

LETTERS TO THE EDITOR

Tunnel Etching of Aluminium

The tunnel etching of aluminium, demonstrated beautifully by Burger, Tull, and Harris,¹ reminds me that during a study of the pitting mechanism of aluminium in chloride solutions,² I came to the conclusion that the anodic reaction in this case was an autocatalytic process at low rates of attack. For this reason, at any given applied current the attacked area should become restricted to a small proportion of the surface and lead to pitting. It was also considered that there was a limit to this acceleration process, and that the reaction rate could not increase beyond a certain point. This corresponded to the anodic formation of about $\frac{1}{2}$ filming matter and $\frac{4}{3}$ soluble products. In other words, if the applied current is constant, the attacked area should also remain constant.

The high rate of attack, once established by the autocatalytic process, should be most easily maintained at those places from which diffusion is most difficult, so that in a pit, crack, or, in this case, tunnel, the most likely place of attack is at the tip. The walls should remain unattacked.

If this mechanism is accepted, it seems at first sight to give an explanation for the constant cross-sectional area of the tunnels, but, of course, it does not in itself explain the other observed geometrical features, for which there must be a physical explanation.

One difficulty is to understand the relatively high original acidity which is said to be necessary. It would be interesting to know whether the tunnelling does not also occur in less-acid solutions.

C. EDELEANU

*The Brown-Firth Research Laboratories,
Sheffield.*

REFERENCES

1. F. J. Burger, V. F. G. Tull, and P. H. Harris, *Bull. Inst. Metals*, 1955, 3, (1), 6.
2. C. Edeleanu and U. R. Evans, *Trans. Faraday Soc.*, 1951, 47, 1121.

Constitution of Copper-Aluminium Alloys

Regarding the recent letter by Dr. Dowson,¹ we regret having overlooked, in our paper,² the fact that the symbol X had already been used to describe the high-temperature phase discovered by Dr. Dowson himself in 1937. We prefer not to use a Greek symbol to describe the pink-etching phase until its structure is established.

D. R. F. WEST
D. LLOYD THOMAS

*Metallurgy Department,
Imperial College of Science and Technology,
London, S.W.7.*

REFERENCES

1. A. G. Dowson, *Bull. Inst. Metals*, 1955, 3, (2), 21.
2. D. R. F. West and D. Ll. Thomas, *J. Inst. Metals*, 1954-55, 83, (12), 505.

NEWS OF LOCAL SECTIONS AND ASSOCIATED SOCIETIES

South Wales Local Section

At the first meeting of the 1955-56 session, held on 11 October at University College, Swansea, Mr. G. L. BAILEY (Director of the British Non-Ferrous Metals Research Association) gave a lecture on:

The Current Work of the B.N.F.M.R.A.

Mr. Bailey first outlined the organization of the Association; its objects; the type of work undertaken; the Committee structure of the Association; and the distribution of the work between the three Departments of Research, Liaison, and Information. After brief illustrations of the work of the Liaison and Information Departments, the remainder of the lecture was devoted to describing the types of research on which the Association is normally engaged, with particular reference to a study of stretcher-strain markings in aluminium alloys; the properties of cast metals, including grain refinement; corrosion-resistance; and co-operative works studies both in the production of new materials and the joint investigation of the problems such as methods of analysis, tool materials, plant lay-out and operation, &c.

JOINT ACTIVITIES

Mond Nickel Fellowships 1955

The Mond Nickel Fellowships Committee announces the following awards for 1955:

D. H. BUTLER (The Phosphor Bronze Co., Ltd.). To study the production of copper and its alloys, with particular attention to foundry methods, in the United Kingdom, on the continent of Europe, and in America.

R. W. N. DRON (Rhoanglo Mine Services, Ltd.). To study the organization of research and its relation to production in extraction metallurgy in the United Kingdom and North America.

W. F. DUNCAN (The British Aluminium Co., Ltd.). To study the design, lay-out, and operation of continuous strip mills, considering in particular metal behaviour, properties, and quality, roll lubrication and cooling, and the development of automatic controls.

R. H. HANNAFORD (The British Iron and Steel Research Association). To study organization and practice in the ferrous foundry industry in the United Kingdom, Europe, and the United States, with particular reference to lay-out, mechanization, and the application of management techniques.

R. J. HARBORD (John Lysaght's Scunthorpe Steelworks, Ltd.). To study the development of continuous casting in the non-ferrous industry and its application to the production of steel.

Beilby Memorial Awards

From the interest derived from the invested capital of the Sir George Beilby Memorial Fund, at intervals to be determined by the Administrators representing the Royal Institute of Chemistry, the Society of Chemical Industry, and the Institute of Metals, awards are made to British investigators in science to mark appreciation of records of distinguished work. Preference is given to investigations relating to the special interests of Sir George Beilby, including problems connected with fuel economy, chemical engineering, and metallurgy. The awards are made, not on the result of any competition, but in recognition of continuous work of exceptional merit, bearing evidence of distinct advancement in science and practice.

In general, awards are not applicable to workers of established repute, but are granted as an encouragement to younger men who have done original independent work of exceptional merit over a period of years.

The Administrators are empowered to make more than one award in a given year if work of sufficient merit by several candidates is brought to their notice. For 1954 two awards were made, of 150 guineas each, to Dr. H. K. Hardy and Dr. J. W. Menter.

Consideration will be given to the making of an award or awards from the Fund early in 1956. Outstanding work of the nature indicated may be brought to the notice of the Administrators, either by persons who desire to recommend the candidate or by the candidate himself, not later than 31 December 1955, by letter addressed to The Convener of the Administrators, Sir George Beilby Memorial Fund, The Royal Institute of Chemistry, 30 Russell Square, London, W.C.1.

The letter should be accompanied by *nine copies* of a short statement on the candidate's career (date of birth, education and experience, degrees and other qualifications, special awards, &c., with dates) and of a list of references to papers or other works published by the candidate, independently or jointly.

OTHER NEWS

Lectures at Battersea Polytechnic

A course of approximately ten weekly lectures under the title "An Introduction to Some Uses of Radioactive Isotopes" will be given at Battersea Polytechnic, beginning on Tuesday, 10 January 1956 (7-9 p.m.). The fee for the course is £1.

There will also be a course of five lectures on "Ion Exchange and Its Applications", to be given at fortnightly intervals on Thursday evenings beginning on 19 January 1956 (fee 10s.). On the alternate Thursday evenings a practical course is being arranged in conjunction with the lectures (fee 10s.).

DIARY

Local Sections and Associated Societies

19 December. **Birmingham Local Section.** Christmas Lecture for Schoolchildren, by Dr. H. M. Finniston. (Large Lecture Theatre, Physics Department, The University, Birmingham 15, at 2.30 p.m.)

[Members who would like tickets for their children should apply to the Assistant Honorary Secretary of the Section, Mr. L. G. Tottle, 41 Golden Hillock Road, Small Heath, Birmingham 10.]

1956

3 January. **Oxford Local Section.** "Patents", by T. M. Connelly. (Ballroom, Cadena Café, Cornmarket Street, Oxford, at 7.0 p.m.)

5 January. **Birmingham Local Section.** "Recent Developments in Foundry Practice", by Dr. D. V. Atterton. (James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.)

5 January. **Leeds Metallurgical Society.** "The Production of Pure Metals", by Dr. J. C. Chaston. (Large Chemistry Lecture Theatre, The University, Leeds 2, at 7.15 p.m.)

5 January. **London Local Section.** "Grain Boundaries", by Dr. D. McLean. (4 Grosvenor Gardens, London, S.W.1, at 6.30 p.m.)

10 January. **South Wales Local Section.** "Hard Metals", by H. Williams. (Department of Metallurgy, University College, Singleton Park, Swansea, at 6.45 p.m.)

12 January. **Liverpool Metallurgical Society.** Discussion on "Modern Techniques of Metallurgical Analysis". (Liverpool Engineering Society, 9 The Temple, Dale Street, Liverpool, at 7.0 p.m.)

Other Societies

20 December. **Institute of British Foundrymen, East Anglian Section.** Film evening. (Central Hall, Public Library, Ipswich, at 7.30 p.m.)

20 December. **Royal Aeronautical Society.** "Recent Advances in Aircraft Adhesives", by Dr. N. A. de Bruyne. (4 Hamilton Place, London, W.1, at 7.0 p.m.)

1956

4 January. **Institute of Welding, North London Branch.** "The Brittle Fracture of Mild Steel—A Survey", by Dr. Constance F. Tipper. (Manson House, Portland Place, London, W.1, at 7.30 p.m.)

10 January. **Royal Institute of Chemistry, Kent Sub-Section.** "Radioactive Techniques in Industry and Research", by J. L. Putman. (Gravesend Technical College, Mayfield Hall Annexe, Pelham Road, Gravesend, at 7.30 p.m.)

APPOINTMENTS VACANT

APPOINTMENTS VACANT

A COMPANY 20 miles West of London, with an up-to-date Laboratory and excellent working conditions, requires an Assistant Chemist for the analysis of Copper- and Nickel-Base Alloys, stainless steel. Knowledge of spectrographic analysis an advantage. Salary according to age, qualifications, and experience. Applications in writing to Box B.665, Willing's, 362 Grays Inn Road, London, W.C.1.

A DEVELOPMENT ENGINEER with good educational qualifications, preferably in Mechanical Engineering, and a minimum of five years' industrial experience is required for work on the application of industrial GAS TURBINES to solid-fuel firing. Experience in the fields of chemical engineering or fuel technology would be an advantage. The post is a responsible one, and the successful applicant would have to co-ordinate a comprehensive research programme now commencing at a number of centres and direct the utilization of the results on the gas turbine. There will be considerable scope for initiative and for gaining experience in a new field. Salary up to £1100 per annum according to age, qualifications, and experience. Application forms can be obtained from Box No. 397, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

ASSOCIATED ELECTRICAL INDUSTRIES LIMITED, RESEARCH LABORATORY ALDERMASTON

Vacancies exist for graduate SCIENTISTS and for ASSISTANTS to undertake long-term research in problems of PHYSICAL METALLURGY associated with NUCLEAR ENERGY. Scientists should have honours degrees in physics, metallurgy, or chemistry, with some experience of research. Assistants should have a Higher National Certificate or equivalent qualifications.

The Laboratory serves a large group of Companies. It is situated in pleasant rural surroundings near Reading, with a train service to London (one hour).

Please write, giving full details of qualifications and experience, and quoting reference no. M/R/GA/1, to Personnel Officer,

Research Laboratory,
Associated Electrical Industries, Ltd.,
Aldermaston Court,
Aldermaston,
Berkshire.

BRITISH ALUMINIUM COMPANY, LTD., require a Metallurgist Graduate, preferably with some industrial or research experience, age 25-30, to assist the Senior Metallurgist at the Company's Head Office (London, S.W.) in control of the quality of products and development of metallurgical processes at the Company's factories. Salary according to qualifications, age, and experience. Box No. 399, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

DEVELOPMENT METALLURGIST. A West Country factory, involved in the manufacture of aircraft and aircraft accessories, requires a development metallurgist with degree or Higher National Certificate in Metallurgy. The firm is installing a wide range of heat-treatment plant and processing equipment to make equipment for power transmission (mechanical), sub-zero and high-temperature work. The position will be on the monthly staff with salaries in the range £800-£900 p.a. A non-contributory Pension Fund and Bonus scheme are in operation. Write Box No. 400, The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

IMPERIAL CHEMICAL INDUSTRIES, LTD., WILTON WORKS, MIDDLESBROUGH, requires a Metallurgist in the Engineering Materials Section. Preference will be given to candidates under 30 years of age with an Honours Degree in Metallurgy; previous industrial experience is not essential. Work will include investigation of plant failures, problems in welding, corrosion, and protection of metals, and the post offers wide general experience in this field. The laboratories are newly built and well equipped.

The environments provide first-class working conditions, a five-day working week, Pension Fund, Profit-Sharing Scheme, and excellent Company recreational facilities.

Out-of-pocket expenses are paid for applicants invited for interview, and after joining the Staff, married men may receive a refund of removal expenses up to £50, together with rail-travel expenses. Schemes for assistance in housing are available, and for house purchase, facilities exist for loans and advances for legal charges.

Write for application form to: Staff Manager, Imperial Chemical Industries, Ltd., Wilton Works, Middlesbrough.

PHYSICAL METALLURGISTS METALLURGICAL ENGINEERS

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in new well-equipped laboratories

Metal Physicists and Physical Metallurgists for fundamental and development research on the effects of irradiation on metals (including fuels) and other metallurgical problems associated with reactor technology. Opportunities also for those interested in X-ray technique, especially those with experience in this field.

Metallurgical Engineers for Metallurgical Engineering development work directed to fabrication and testing of prototype fuel elements, including all aspects of casting, metal working, joining, &c.

Three weeks' annual vacation.
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Opportunities for promotion.

State all details in first letter to "File 10A" Atomic Energy of Canada, Ltd., Chalk River, Ontario.

PHYSICIST required to lead team in physics section of a metallurgical research laboratory. Applicants must be knowledgeable in the application of physical techniques to metallurgical materials and processes. Age 30-35. Initial salary £1100 upwards, depending on qualifications and experience. Apply: Research Manager, British Non-Ferrous Metals Research Association, 81-91 Euston Street, London, N.W.1.

RESEARCH METALLURGIST required by British Insulated Callender's Cables, Ltd., at their Shepherds Bush Laboratories. The successful applicant, who should have an Honours Degree in metallurgy and preferably some experience of metallurgical research, is required for work on the various problems connected with the cable-making industry. The laboratory is engaged on a wide range of research problems associated with the Company's large-scale processing and utilization of non-ferrous metals, and the post offers good prospects for advancement. Every opportunity will be given for visiting the Company's factories and becoming thoroughly familiar with its metallurgical processes. Five-day week. Pension Fund. Apply, giving full particulars of age, qualifications, and experience, to Staff Officer, B.I.C.C., Ltd., 21 Bloomsbury Street, London, W.C.1, quoting reference L/97/54.

SCIENTIFIC DIRECTOR

A qualified Metallurgist and Chemist, aged 50/55, with wide industrial experience of control, research, and development, is required by well-established Non-Ferrous and Chemical Manufacturers. He must be an able administrator and organizer with experience at Board level, and should preferably have U.S.A. contacts. Write, giving brief but essential details in first instance, which will be treated in strict confidence, to Box No. 398, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

UNIVERSITY OF BIRMINGHAM

DEPARTMENT OF INDUSTRIAL METALLURGY

Two vacancies exist in research teams concerned with the Joining of Metals and with the Fatigue of Light Alloys. The successful applicant will be encouraged to submit work for higher degrees, and allowances additional to salary will be made to cover all University fees. Applications are invited from suitably qualified metallurgists, physicists, and chemists. Initial salaries are in the range £400-£500, depending on age and experience. Applications in writing to the Department of Industrial Metallurgy, University, Birmingham, 15.

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